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(54) **Tube coupling protective device**

(57) A protective device particularly for tube couplings for medical use such as cannula or trocar tubes, has a region immediately surrounding the open end 17 of the coupling protected by a guard in the form of a ring 21 spaced from the opening by supporting arms 22, so that the coupling is available to enable junctions to be made but does not readily come into contact with potentially contaminating hands or surfaces, even when the coupling is allowed to lie on a surface or patient's flesh.

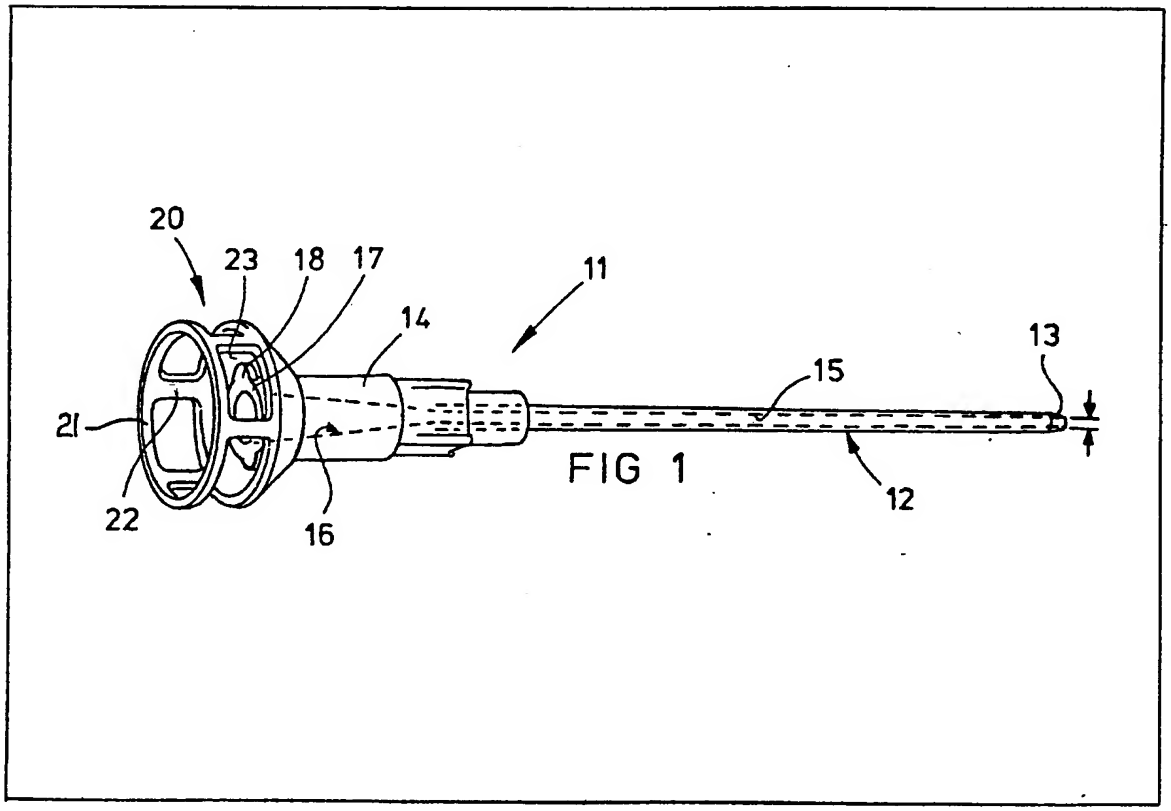

FIG 1

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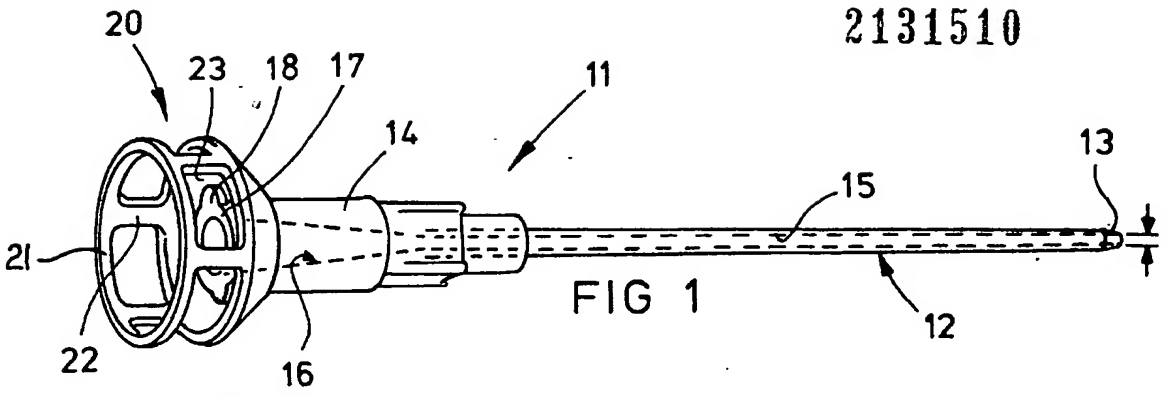

FIG 1

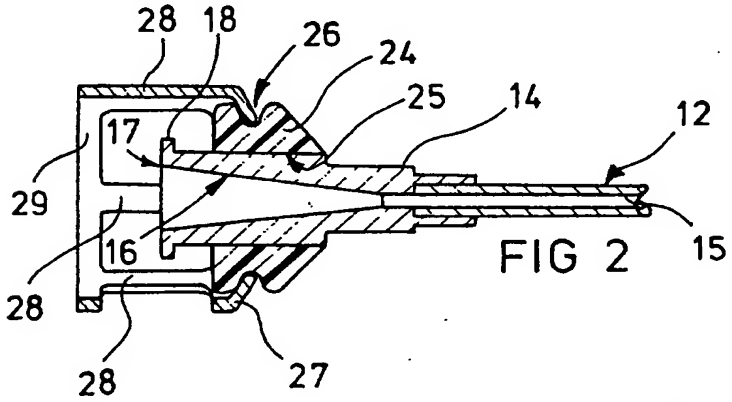

FIG 2

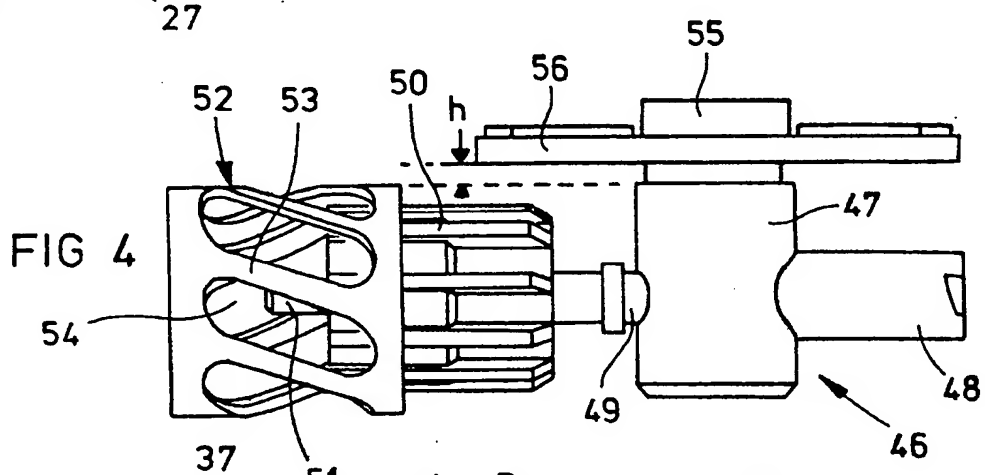

FIG 4

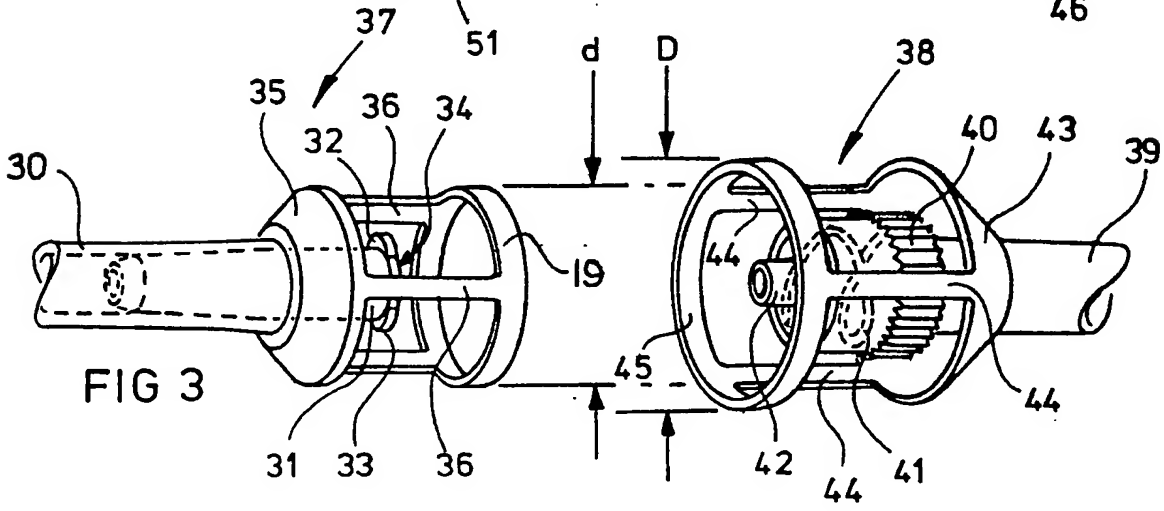

FIG 3

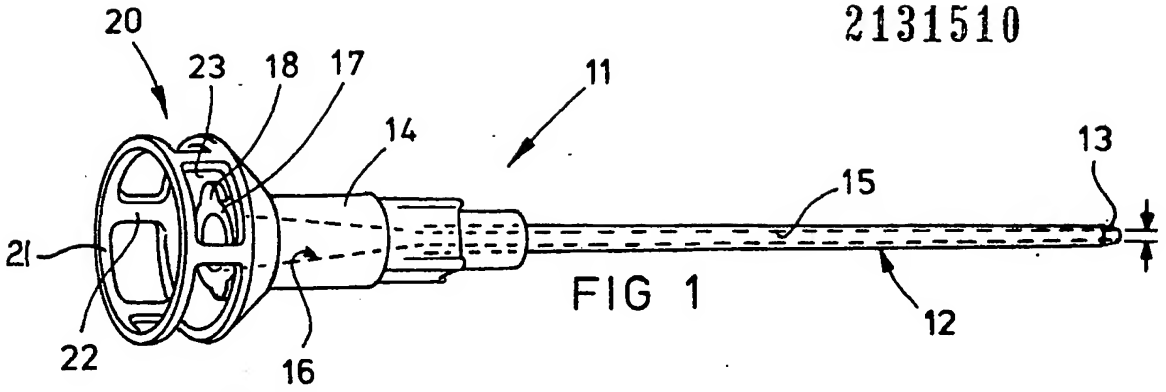

FIG 1

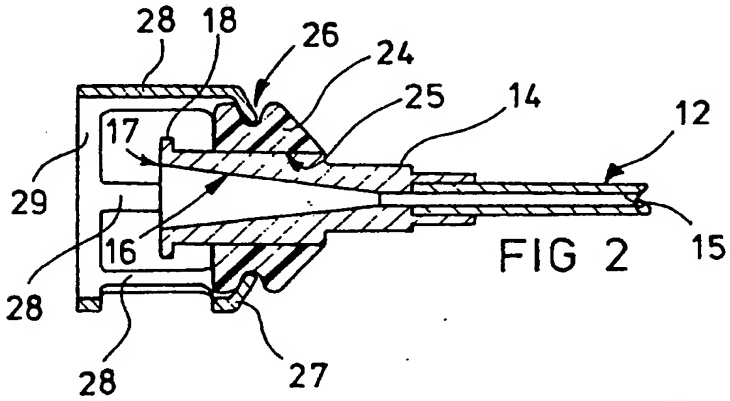

FIG 2

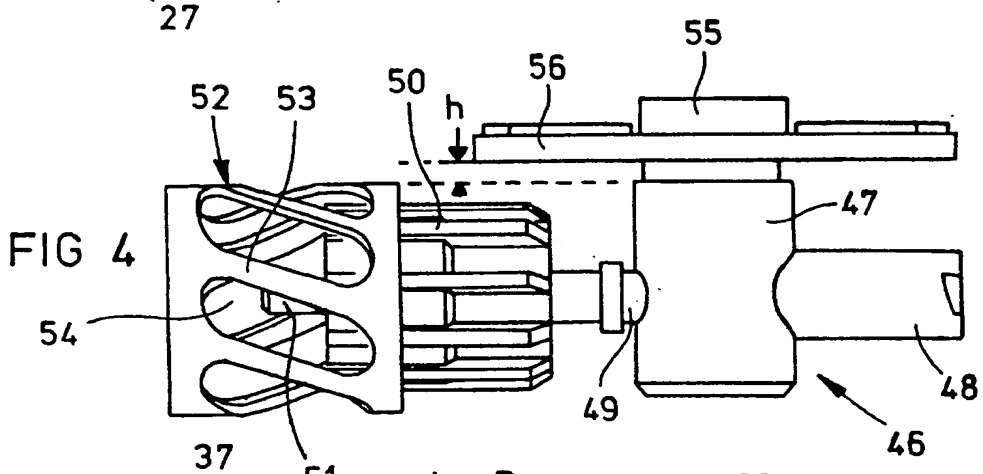

FIG 4

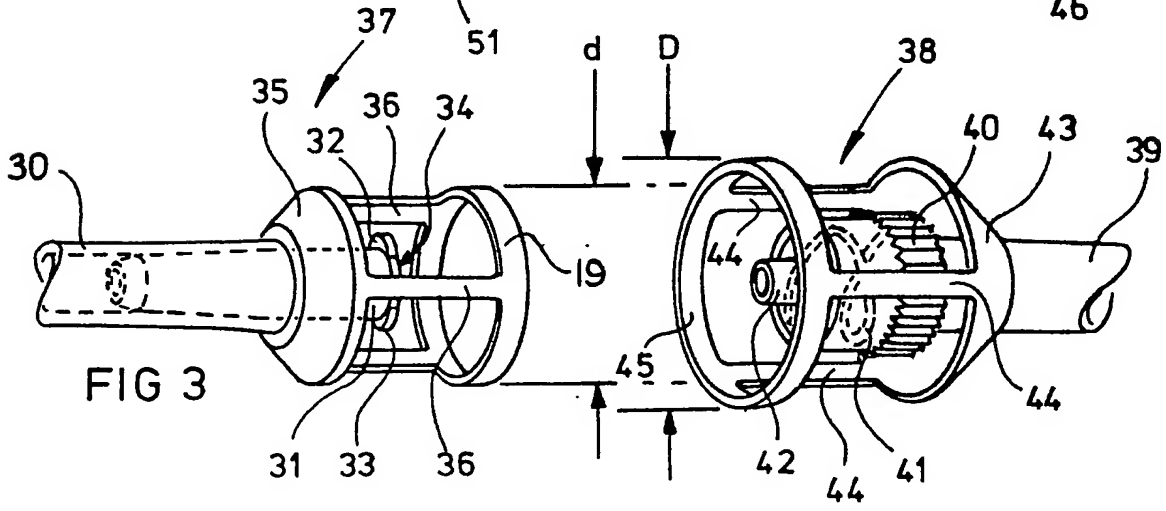

FIG 3

into a transverse end wall by which the sleeve is secured at one end to the coupling element.

Instead of the generally cylindrical sleeve or encircling guard elements described above, the guard element may comprise only a plurality of arms extending from a common base member. Such arms may extend axially, that is to define generatrices of a cylindrical surface, or may extend axially and radially to form effective generatrices of a conical surface. In addition such arms may be curved or straight, and may be inclined to a plane parallel to the axis of the coupling element. Further, some of the arms may be interconnected at or adjacent their ends and/or a mid point thereof.

The present invention also comprehends a tube coupling device having an opening (which may be closable) and a protective guard for the opening, the guard encircling a region axially spaced from the opening in such a way as to prevent contact with the coupling in the region of the opening except by a suitably shaped component of a cooperating coupling device.

A tube coupling device such as defined above may incorporate a tap having an operating handle or lever turnable in a plane parallel to the length of the tube when attached to the coupling, and the dimensions of the guard element are such that in any orientation thereof it does not obstruct movement of the tap operating handle.

In addition, the present invention provides a composite protective device for a tube coupling for medical use, such as at the end of a cannula or trocar having an opening for the passage of fluids, comprising a resilient mounting element, the resilience of which permits it to be fitted onto a tube coupling, and a substantially rigid guard element which can be fitted onto the said resilient element and is shaped to obstruct entry of any object into the region axially outwardly of the fluid passage opening to resist contact of the tube coupling with objects in its immediate environment.

Further, the present invention provides a tube coupling arrangement comprising male and female tube couplings each having a protective devices as hereinbefore defined, the dimensions of the protective devices being such that they fit together upon connection of the male and female parts of the tube coupling arrangement.

Such interfitting may be obtained by having generally axially extending sleeves as guard elements, one sleeve having a larger diameter than the other so that the sleeves fit into one another when the tube coupling arrangement is connected, or alternatively if the guard element is formed as a plurality of arms, these may be arranged to intercalate upon interconnection of the tube coupling components. For this purpose the guard element may be turnable with respect to the tube coupling elements although if interfitting sleeves are provided then these need not be relatively turnable although they are turnable in the preferred embodiment.

The guard element may be provided in the form of a ring lying in a plane generally perpendicular to the axis of the tube coupling and held in position by axial or inclined arms extending from a rigid base secured to the tube coupling or formed integrally with the tube coupling.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a first embodiment of the invention;

Figure 2 is an axial section of a second embodiment of the invention;

Figure 3 is a side view of a tube coupling incorporating guard elements constituting embodiments of the present invention; and

Figure 4 is a side view of a tap and coupling arrangement incorporating a guard element formed as an embodiment of the present invention.

Referring first to Figure 1 there is shown a tube coupling generally indicated 11 for connecting a drip feed tube to a cannula 12. The cannula 12 is, as in conventional such instruments, provided with a slightly tapering pointed end 13 and has a hollow passage 15 extending from end to end of a suitable diameter such as the diameter *a* indicated in Figure 1.

At the end remote from the tapered end 13 the cannula 12 is fitted into a coupling body 14 of generally cylindrical shape having a tapering passage 16 which widens from the narrow diameter *a* to a mouth 17 at a free open end of the coupling body 14 intended to receive a correspondingly tapered nozzle of a cooperating coupling element for securing a tube or pipe which is to convey medication to the cannula or carry away blood allowed to enter the cannula 12 through the opening at the tapering end 13. It will be appreciated that in use the cannula 12 is introduced into a vein through a small opening in the skin, and the material of the cannula 12 is slightly flexible to allow it to be pushed along inside the vein and make a fairly firm fit so that blood can flow from the vein through the passage 15 and into any tube connected by the coupling 14 or fluids which are to be introduced into the vein can be passed along the passage 15 into the vein.

Such a cannula described thus far is known and in widespread use for medication and therapy involving continual introduction or withdrawal of fluids through the patient's vein. Conventionally the cannula 12 is held in position by adhesive tape to the patient's body and the free end 17 of the coupling 14 is allowed to lie in contact with the patient's skin where it may pick up infection from the skin itself, or where it may come into contact with the bedding or other objects in the patient's immediate environment if the relevant part of the body is moved between treatments. Moreover, nursing staff have to handle the coupling 14 in order to connect or disconnect the cooperating parts of the tubing involved in withdrawing or introducing fluids through the cannula 12 and

bacteriological contamination of the open end 17 can occur in this way. The guard element of the present invention, generally indicated by the reference numeral 20 in Figure 1, is therefore provided in order to prevent the occurrence of physical contact between the open end 17 and any object except the tapering nozzle which is to be introduced into the tapering passage 16 in the coupling 14. The guard element 20 comprises a ring 21 supported by a plurality of axial arms 22 which extend from a transverse end wall 23 having an opening to allow it to be fitted over the body of the coupling 14 which is generally circular. In other embodiments (not shown) the arms 22 may be of a larger circumferential dimension so that they, together with the ring 21, can be considered as a cylindrical surface having apertures rather than the structure as shown being formed as a ring 21 and axial arms 22.

In the embodiment of Figure 1 the guard element 20 may be integrally formed with the body 14 of the coupling.

The present invention also comprehends the provision of a guard element to be fitted to existing equipment not provided with such. One embodiment of this type is illustrated in Figure 2 where the reference numerals relating to the cannula and coupling are identical with those of Figure 1 where they identify the same components. Over the body 14 of the coupling is fitted a resilient mounting element 24 in the form of a grommet having a circular central aperture 25 and a peripheral outwardly directed groove 26 into which is received a radially inwardly directed flange 27 of the guard element. Extending axially from the flange 27 the outer ends of the arms 28 are all interconnected by a ring 29 and, together with this ring 29 constitutes a guard surrounding the free end 17 of the coupling body 14 to obstruct the approach of any object except the nozzle intended to enter the tapering passage 16. For example, when the coupling 14 is disconnected from the tubing constituting part of the medication or therapy equipment and allowed to rest on the patient's skin, the arms 28, supported by the ring 29 will hold the free end 17 of the coupling body 14 spaced from the skin so that bacterial contamination by contact cannot occur. Likewise, when the nursing staff grip the coupling 14 to connect or disconnect the cooperating equipment, the open end 17 of the coupling body 14 cannot be touched, and, again, contamination by contact is prevented.

In the embodiment of Figure 3 two cooperating connectors are shown with respective guard elements 37, 38 which allow the coupling to be connected and disconnected without obstruction, but which serve to prevent any other contact with the coupling components themselves. This coupling arrangement comprises a coupling body 31 similar to the body 14 having two transverse lugs 32, 33 at the free open end of the body 31 into which opens a passage 34 corresponding to the passage 16 in the embodiments of Figures 1 and 2. A tube 30 is connected to the body 31 for the introduction or withdrawal of fluids to a patient. Surrounding the free end of the body 31 is a guard element 37 comprising a radial wall 35 secured to or integrally formed with the body 31 and from which project four axial arms 36 supporting at their free ends a ring 19 which surrounds the region axially spaced from the open end of the body 31. The diameter of the ring 19 is indicated in the drawing by the reference *d*. The cooperating coupling is for attaching a tube 39 and includes a coupling body 40 of generally cylindrical form having two helical grooves 41 formed on the inner surface for receiving the lugs 32, 33 of the coupling body 31. Centrally within the body 40 is a tapering nozzle 42 the angle of taper and dimensions of which are such that it fits tightly within the tapering passage 34. Surrounding the body 40 is a guard element 38 comprising a radial, slightly conical wall 43 from which project three axial arms 44 supporting at their free ends a ring 45 the diameter of which *D* is sufficiently larger than the diameter *d* of the ring 19 to allow the guard element 37 to be fitted within the guard element 38 with no contact between them when a coupling of the coupling element 31 and the coupling element 40, 42 is made. Such coupling is effected by introducing the nozzle 42 into the opening 34 and at the same time the lugs 32, 33 enter the helical grooves 41 so that by them turning the two coupling bodies 31, 40 relatively with respect to one another, clockwise as viewed from the tube end 30 or 39 the lugs 32, 33 travel down the grooves 41 and hold the two couplings together by frictional interengagement.

Again, the guard element 37, 38 may be integrally moulded with the couplings 31, 40 or may be fitted on after moulding and either secured in position by adhesive or by virtue of being a force fit or by means of a resilient mounting element such as the element 24 illustrated in Figure 2.

Turning now to Figure 4 there is shown a tap 46 having an inlet 48 to a tap body 47 and an outlet 49 leading to a coupling 50 having a tapering nozzle 51 within a generally cylindrical sleeve similar to the sleeve 40 in the coupling illustrated in Figure 3. Surrounding the sleeve 50 and secured thereto is a generally cylindrical guard sleeve 52 held by a radial wall (not illustrated) at one end to the sleeve 50. The sleeve 52 has a plurality of apertures 54 formed therein separated by inclined arms 53. The diameter of the sleeve 52 is such that there is a small clearance *h* between it and the lever 56 of a tap operating member 55.

By providing the apertures 54 the sleeve 52 can allow the escape of blood dripping from the nozzle 51 in use and likewise can permit the easy flushing of the whole coupling with a suitable bactericidal cleaning fluid when this is necessary. The sleeve 52 may be rigidly held in position or may be axially displaceable.

In this way the guard elements prevent physical contact at the ends of the couplings so that infection cannot enter the tubing. It should be emphasised that although a coupling attached to a

cannula 12 is specifically illustrated in Figure 1 the couplings may be provided at any point in the tubing system of a therapy unit, and such tubing system may include T and Y couplings as well as the straight couplings illustrated in the drawings. Similar male/female components for connection of the tubes constituting the tubing system may be provided at each junction.

CLAIMS

1. A protective device for a tube coupling having an opening, comprising a guard element which when fitted to the coupling occupies at least part of the region axially outwardly spaced from the opening, the guard element including means for attaching it to a tube or tube coupling at a position spaced inwardly from the said opening in the tube couplings such that the guard element is substantially rigidly held in position to obstruct contact with the tube coupling in the region of the opening.

2. A protective device as claimed in Claim 1 in which the guard element substantially surrounds the said region axially outwardly spaced from the opening in the tube connector.

3. A protective device as claimed in Claim 2, in which the guard element is held in position by one or more arms extending generally axially with respect to the tube opening.

4. A protective device as claimed in Claim 2, in which the guard element comprises a generally cylindrical sleeve member attached or attachable by one end to the tube coupling.

5. A protective device as claimed in Claim 4, in which the cylindrical sleeve member has a transverse end wall with an aperture therein to form a radially inwardly directed flange which is received in a radially outwardly directed groove in a resilient attachment member having a central aperture by means of which the attachment member can be fitted over the tube coupling.

6. A protective device as claimed in Claim 4 or Claim 5, in which the said generally cylindrical sleeve member has a plurality of apertures in the curved wall thereof.

7. A protective device as claimed in Claim 6, in which the said apertures extend into at least part of a transverse end wall of the sleeve.

8. A protective device as claimed in Claim 3, in which the guard element is held in position by one or more arms which lie in an imaginary common conical surface with the narrow end nearer the tube opening.

9. A protective device as claimed in Claim 1, in which the guard element includes a plurality of arms extending from a common base member.

10. A protective device as claimed in Claim 9, in which the said arms extend axially to define a cylindrical common surface, or extend at an angle to the line defined by a common axis, and lie in radial planes with respect thereto to define a conical configuration.

11. A protective device as claimed in Claim 9 or Claim 10, in which at least some of the arms are interconnected at or adjacent their ends and/or a mid point thereof.

12. A tube coupling device having an opening and a protective guard for the opening, the guard encircling a region axially spaced from the opening in such a way as to prevent contact with the coupling in the region of the opening except by a suitably shaped component of a cooperating coupling device.

13. A tube coupling device as claimed in Claim 12, in which the tube coupling device incorporates a tap having an operating handle or lever turnable in a plane parallel to the length of the tube when attached to the coupling, and the dimensions of the guard element are such that in any orientation thereof it does interfere with movement of the tap-operating handle.

14. A composite protective device for a tube coupling for medical use, such as at the end of a cannula or trocar having an opening for the passage of fluids, comprising a resilient mounting element, the resilience of which permits it to be fitted onto a tube coupling, and a substantially rigid guard element which can be fitted onto the said resilient element and is shaped to obstruct entry of an object into the region axially outwardly of the fluid passage opening to resist contact with the tube coupling with objects in its immediate environment.

15. A tube coupling arrangement comprising male and female tube couplings each having a protective device as claimed in any preceding Claim, the dimensions of the protective devices being such that they fit together upon connection of the two tube couplings.

16. A tube coupling arrangement as claimed in Claim 15 in which the protective devices include sleeves which interfit upon fitting together of the two tube couplings.

17. A tube coupling arrangement as claimed in Claim 15, in which the protective devices include a plurality of arms which intercalate upon fitting together of the two tube couplings.

18. A tube coupling arrangement as claimed in any of Claims 15, 16 or 17, in which the guard is free to turn with respect to the tube coupling.

19. A tube coupling arrangement as claimed in Claim 15 or Claim 18 when dependent directly thereon, in which the guard is in the form of a ring lying in a plane generally perpendicular to the axis of the tube coupling and is held in position by axial or inclined arms.

20. A tube coupling arrangement as claimed in any of Claims 15 to 19, in which the guard is integrally moulded with the coupling.

21. A tube coupling arrangement substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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